

SATISH SCIENCE ACADEMY

**DHANORI PUNE-411015** 

# SURFACE AREAS AND VOLUMES

# **Class 09 - Mathematics**

### **Time Allowed: 3 hours**

#### Maximum Marks: 190

#### Section A

1.	solid sphere is cut into two hemispheres. The ratio of the surface areas of sphere to that of two hemispheres [		
	taken together, is:		
	a) 3 : 2	b) 1 : 1	
	c) 2 : 3	d) 1:4	
2.	The largest sphere is cut off from a cube of side 6 cm.	The volume of the sphere will be	[1]
	a) $_{27}  \pi \text{cm}^3$	b) <sub>36πcm<sup>3</sup></sub>	
	c) $108\pi \text{cm}^3$	d) $12\pi cm^3$	
3.	A cube of side 4 cm contains a sphere touching its sid	es. Find the approximate volume of the gap in between.	[1]
	a) $_{33.52}$ cm <sup>3</sup>	b) 30.48 cm <sup>3</sup>	
	c) <sub>34 cm<sup>3</sup></sub>	d) <sub>33 cm<sup>3</sup></sub>	
4.	The volumes of two spheres are in the ratio 125: 64. T	The ratio of their surface areas is	[1]
	a) 25 : 16	b) 16 : 9	
	c) 16 : 25	d) 9 : 16	
5.	A metallic sphere of radius 3cm is melted and recast i	nto the shape of a cylinder of radius 6cm. The height of the	[1]
	cylinder is		
	a) 4cm	b) 1cm	
	c) 3cm	d) 2cm	
6.	A conical vessel whose internal depth is 42 cm and in	ternal diameter is 48 cm is full of water. If 1 cubic dm of	[1]
	water weight 1 kg wt, then the weight of water in the conical vessel is		
	a) 26.5 kg wt.	b) 25.65 kg wt.	
	c) 25.5 kg wt.	d) 25.344 kg wt.	
7.	The diameter of the base of a cone is 42 cm and its vo	lume is 12936 cm <sup>3</sup> . Its height is	[1]
	a) 28 cm	b) 14 cm	
	c) 21 cm	d) 35 cm	
8.	Two right circular cones have equal radii. If their slan surface areas are in the ratio	t heights are in the ratio 4 : 3, then their respective curved	[1]
	a) 16:9	b) 4:3	

	c) 6:8	d) 3 : 4	
9.	The ratio between the volume of a sphere and volume	of a circumscribing right circular cylinder is	[1]
	a) 2 : 3	b) 2 : 1	
	c) 1 ; 2	d) 1 : 1	
10.	A solid is in the shape of a cone standing on a hemisp	here with both their radii being equal to 1cm and the height	[1]
	of the cone is equal to its radius. The volume of the so	olid is	
	a) $\pi  cm^3$	b) $4\pi  cm^3$	
	c) $2\pi  cm^3$	d) $3\pi  cm^3$	
11.	<b>Assertion (A):</b> The total surface area of a cone whose <b>Reason (R):</b> Total surface area of cone is $\pi r(l + r)$ where $\pi r(l + r)$ where $\pi r(l + r)$ is the surface area of cone is $\pi r(l + r)$ .	e radius is $rac{r}{2}$ and slant height 2l is $(\pi)r\left(l+rac{r}{4} ight)$ . Here r is radius and l is the slant height of the cone.	[1]
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
12.	Assertion (A): The curved surface area of a right circ	ular cone whose slant height is 10 cm and base radius is 7	[1]
	cm.		
	<b>Reason (R):</b> Curved surface area = $\pi$ rl.		
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct expranation of A.	
10	c) A is true but R is false.	d) A is false but R is true.	
13.	Assertion (A): If the height of a cone is 24 cm and th	e diameter of the base is 14 cm, then the slant height of the	[1]
	<b>Reason (R):</b> If r be the radius and h is the slant heigh	t of the cone, then slant height = $\sqrt{h^2+r^2}$	
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
14.	Assertion (A): The radii of the two cones are in the	atio 2 : 3 and their volumes in the ratio 1 : 3. Then the ratio	[1]
	of their heights is 3 : 2.		
	<b>Reason (R):</b> Volume of the cone = $\frac{1}{3}\pi r^2$ . <i>h</i>		
	a) Both A and R are true and R is the correct explanation of A.	b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	
15.	<b>Assertion (A):</b> A shot put is a metallic sphere of radi	us 4 cm. If the density of the metal is 10 g per cm <sup>3</sup> . then the	[1]
	mass of the shot put is 2 kg.		
	<b>Reason (R):</b> Volume of sphere of radius r is $\frac{4}{3}\pi r^3$ .		
	a) Both A and R are true and R is the correct	b) Both A and R are true but R is not the	
	explanation of A.	correct explanation of A.	
	c) A is true but R is false.	d) A is false but R is true.	

16.	<b>Assertion (A):</b> If a ball is in the shape of a sphere has a surface area of 221.76 cm <sup>2</sup> , then its diameter is 8.4 cm.	[1]
	<b>Reason (R):</b> If the radius of the sphere be r, then surface area, S = $4\pi r^2$ , i.e, $r = \frac{1}{2}\sqrt{\frac{S}{\pi}}$	
	a) Both A and R are true and R is the correct b) Both A and R are true but R is not the	
	explanation of A. correct explanation of A.	
	c) A is true but R is false. d) A is false but R is true.	
17.	Assertion (A): The volume and surface area of a sphere are related to each other by radius.	[1]
	<b>Reason (R):</b> The relation between the Surface area S and Volume V is: $S^3 = 36\pi V^2$ .	
	a) Both A and R are true and R is the correctb) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false. d) A is false but R is true.	
18.	<b>Assertion (A):</b> A shot-putt is a metallic sphere of radius 4.9 cm. If the density of the metal is 7.8 g per cm <sup>3</sup> the mass of the shot-put 3.85 kg. <b>Reason (R):</b> Volume of the sphere = $\frac{4}{3}\pi r^3$ .	[1]
	a) Both A and R are true and R is the correct b) Both A and R are true but R is not the	
	explanation of A. correct explanation of A.	
	c) A is true but R is false. d) A is false but R is true.	
19.	<ul><li>Assertion (A): If the radius of a cone is halved and volume is not changed, then height remains same.</li><li>Reason (R): If the radius of a cone is halved and volume is not changed then height must become four times of the original height.</li></ul>	[1]
	a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false. d) A is false but R is true.	
20.	Assertion (A): A cone is a solid figure.	[1]
	<b>Reason (R):</b> A cone is generated when a right angled triangle is rotated about its base.	
	a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.	
	c) A is true but R is false. d) A is false but R is true.	
	Section B	
21.	If the number of square centimetres on the surface of a sphere is equal to the number of cubic centimetres in its volume, what is the diameter of the sphere ?	
22.	A storage tank consists of a circular cylinder with a hemisphere adjoined on either end. If the external diameter	[2]
	of the cylinder be 1.4 m and its length be 8 m, find the cost of painting it on the outside at the rate of $\gtrless$ 10 per m <sup>2</sup> .	
23.	Find the surface area of a sphere whose volume is $4851 \text{ cm}^3$ .	
24.	A cloth having an area of 165 m <sup>2</sup> is shaped into the form of a conical tent of radius 5 m. Find the volume of the cone.	
25.	Find the capacity in litres of a conical vessel with radius 7 cm, slant height 25 cm.	[2]
26.	A conical vessel whose internal dimensions are 105 cm deep and 120 cm in diameter is full of water. If a cubic decimetre of water weights 1 k 500 g, find the weight of water contained in the vessel.	[2]

29.	Find the volume and the total surface area of a hemisphere of radius 3.5 cm. (Use $\pi$ = 22/7).	[2]				
30.	The slant height and base diameter of a conical tomb are 25 m and 14 m respectively. Find the cost of white	[2]				
	washing its curved surface at the rate of $\gtrless$ 210 per 100 m <sup>2</sup> .					
31.	A cone and a hemisphere have equal bases and equal volumes. Find the ratio of their heights.	[2]				
32.	A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin-plating it on the inside at	[2]				
	the rate of ₹32 per 100 cm <sup>2</sup> .					
33.	A dome of a building is in the form of a hemisphere. From inside, it was whitewashed at the cost of ₹ 498.96. If	[2]				
	the cost of white-washing is ₹ 2.00 per square metre, find the inside surface area of the dome and volume of the					
	air inside the dome.					
34.	The water for a factory is stored in a hemispherical tank whose internal diameter is 14 m. The tank contains 50	[2]				
	kilolitres of water. Water is pumped into the tank to fill to its capacity. Calculate the volume of water pumped					
	into the tank.					
35.	A semi-circular sheet of metal of diameter 28 cm is bent to form an open conical cup. Find the capacity of the	[2]				
	cup.					
36.	Sameera wants to celebrate the fifth birthday of her daughter with a party. She bought thick paper to make the	[2]				
	conical party caps. Each cap is to have a base diameter of 10 cm and height 12 cm. A sheet of the paper is 25 cm					
	by 40 cm and approximately 82% of the sheet can be effectively used for making the caps after cutting. What is					
	the minimum number of sheets of paper that Sameera would need to buy, if there are to be 15 children at the					
	party? (Use $\pi = 3.14$ )					
37.	The base radii of the two right circular cones of the same height are in the ratio 3 : 5. Find the ratio of their	[2]				
	volumes.					
38.	The surface area of a sphere is 346.5 cm <sup>2</sup> . Find its radius and hence its volume.	[2]				
39.	The radius of a spherical balloon increases from 7 cm to 14 cm as air is being pumped into it. Find the ratio of	[2]				
	surface areas of the balloon in the two cases.					
40.	A conical tent is 10 m high and the radius of its base is 24 m. Find	[2]				
	i. Slant height of the tent.					
	ii. Cost of the canvas required to make the tent, if the cost of $1 \text{ m}^2$ canvas is ₹ 70.					
	Section C					
41.	A heap of rice is in the form of a cone of diameter 9 m and height 3.5 m. Find the volume of rice. How much	[3]				
	canvas cloth is required to just cover the heap?					
42.	How many spheres 12 cm in diameter can be made from a metallic cylinder of diameter 8 cm and height 90 cm?	[3]				
43.	The radius and height of a cone are in the ratio 3 : 4 and its volume is 301.44 cm <sup>3</sup> . Find the radius and slant	[3]				
-	height of the cone. (Take $\pi$ = 3.14).					
44	The height of a cone is 15 cm. If its volume is 1570 cm <sup>3</sup> find the diameter of the base. (Use $\pi = 3.14$ )	[3]				

Find the length of cloth used in making a conical pandal of height 100 m and base radius 240 m, if the cloth is

How many lead balls, each of radius 1 cm, can be made from a sphere of radius 8 cm?

27.

28.

 $100\pi$  m wide.

CONTACT:8830597066 | 9130946703

[2]

[2]

- 45. A hemispherical tank of radius 1.75 m is full of water. It is connected with a pipe which empties it at the rate of [3] 7 litres per second. How much time will it take to empty the tank completely?
- 46. A heap of wheat is in the form of a cone whose diameter is 10.5 m and height is 3 m. Find its volume. The heap [3] is to be covered by canvas to protect it from rain. Find the area of the canvas required.
- 47. The radius of the base of a right circular cone of semi-vertical angle  $\alpha$  is r. Show that its volume is  $\frac{1}{3}\pi r^3 \cot \alpha$  [3] and curved surface area is  $\pi r^2 \csc \alpha$ .
- 48. Two hemispherical domes are to be painted as shown in the given figure. If the circumferences of the bases of [3] the domes are 17.6 cm and 70.4 cm respectively, then find the cost of painting at the rate of Rs.10 per cm<sup>2</sup>.



- 49. A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled [3] cardboard. Each cone has a base diameter of 40 cm and a height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is Rs. 12 per m<sup>2</sup>, what will be the cost of painting all these cones? (Use  $\pi$  = 3.14 and  $\sqrt{1.04}$  = 1.02).
- 50. A heap of rice is in the form of a cone of base diameter 24 m and height 3.5 m. Find the volume of the rice. How **[3]** much canvas cloth is required to just cover the heap?
- 51. The internal and external diameters of a hollow hemispherical vessel are 20 cm and 28 cm respectively. Find the [3] cost of painting the vessel all over at 35 paise per cm<sup>2</sup>.
- 52. A heap of wheat is in the form of a cone of diameter 9 m and height 3.5 m. Find its volume. How much canvas [3] cloth is required to just cover the heap? (Use  $\pi$  = 3.14).
- 53. A capsule of medicine is in the shape of a sphere of diameter 3.5 mm. How much medicine is needed to fill this [3] capsule?
- 54. Find the volume, curved surface area and the total surface area of a cone having base radius 35 cm and height 12 **[3]** cm.
- 55. A conical tent is 10 m high and the radius of its base is 24 m. Find the slant height of the tent. If the cost of 1 m<sup>2</sup> **[3]** canvas is ₹ 70, find the cost of canvas required to make the tent.
- 56. A cone of height 8 m has a curved surface area 188.4 square metres. Find its volume. (Take  $\pi$  = 3.14) [3]
- 57. Find the curved surface area and the total surface area of a hemisphere of radius 21 cm. [3]
- 58. The internal and external diameters of a hollow hemispherical vessel are 24 cm and 25 cm respectively. The cost [3] to paint 1 cm<sup>2</sup> of the surface is Rs 0.05. Find the total cost of painting the vessel all over.
- A hemispherical bowl made of brass has inner diameter 10.5 cm. Find the cost of tin-plating it on the inside at [3] the rate of ₹ 16 per 100 cm<sup>2</sup>.
- 60. The largest sphere is carved out of a cube of a side 7 cm. Find the volume of the sphere that is carved out. [3]

# Section D

Balwant is corn cob seller. During the lockdown in the year 2020, his business was almost lost. So, he started [4] selling corn grains online through Amazon and Flipcart. Just to understand how many grains he will have from one corn cob, he started counting them. being a student of mathematics let's calculate it mathematically. Let's

assume that one corn cob (see Fig.), shaped somewhat like a cone, has the radius of its broadest end as 2.1 cm and length as 20 cm.



- i. Find the curved surface area of the corn cub.
- ii. If each 1 cm<sup>2</sup> of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob?
- 62. A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled [4] cardboard. Each cone has a base diameter of 40 cm and a height of 1 m.



- i. Find the curved surface area of the cone.
- ii. If the outer side of each of the cones is to be painted and the cost of painting is ₹ 12 per m<sup>2</sup>, what will be the cost of painting all these cones? (Use  $\pi$  = 3.14 and take  $\sqrt{1.04}$  = 1.02)

### 63. Read the following text carefully and answer the questions that follow:

In the Meharali, New DTC bus stop was constructed. The bus stop is barricaded from the remaining part of the road, by using 50 hollow cones. Each hollow cone is made of recycled cardboard.

Each cone has a base diameter of 40 cm and a height of 1 m.



- i. Find the curved surface area of the cone. (1)
- ii. What is the volume of a cone? (1)
- iii. If the outer side of each of the cones is to be painted and the cost of painting is ₹12 per m<sup>2</sup>, what will be the cost of painting all these cones? (2)

OR

If the cost of cardboard is  $\gtrless 100$  per m<sup>2</sup> then what will be cost of cardboard for 50 cones? (2)

#### 64. **Read the following text carefully and answer the questions that follow:**

Once upon a time in Ghaziabad was a corn cob seller. During the lockdown period in the year 2020, his business was almost lost.

[4]

[4]

So, he started selling corn grains online through Amazon and Flipcart. Just to understand how many grains he will have from one corn cob, he started counting them.

Being a student of mathematics let's calculate it mathematically. Let's assume that one corn cob (see Fig.), shaped somewhat like a cone, has the radius of its broadest end as 2.1 cm and length as 20 cm.



- i. Find the curved surface area of the corn cub. (1)
- ii. What is the volume of the corn cub? (1)
- iii. If each 1 cm<sup>2</sup> of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob? (2)

OR

How many such cubs can be stored in a cartoon of size 20 cm imes 25 cm imes 20 cm. (2)

## 65. Read the following text carefully and answer the questions that follow:

Once four friends Rahul, Arun, Ajay and Vijay went for a picnic at a hill station. Due to peak season, they did not get a proper hotel in the city. The weather was fine so they decided to make a conical tent at a park. They were carrying 300 m<sup>2</sup> cloth with them. As shown in the figure they made the tent with height 10 m and diameter 14 m. The remaining cloth was used for the floor.



- i. How much Cloth was used for the floor? (1)
- ii. What was the volume of the tent? (1)
- iii. What was the area of the floor? (2)

## OR

What was the total surface area of the tent? (2)

#### Section E

- 66. A hemispherical dome of a building needs to be painted. If the circumference of the base of the dome is 17.6 m, [5] find the cost of painting it, given the cost of painting is ₹ 5 per 100 cm<sup>2</sup>.
- 67. A corn cob (see Fig.), shaped somewhat like a cone, has the radius of its broadest end as 2.1 cm and length as 20 **[5]** cm. If each 1 cm<sup>2</sup> of the surface of the cob carries an average of four grains, find how many grains you would find on the entire cob?

[4]



- 68. The height of a cone is 24 cm and the diameter of its base is 14 cm. Find the slant height, volume, area of curved **[5]** surface and the total surface area of the cone.
- 69. A hemispherical depression is cut out from one face of a cubical wooden block of edge 21 cm, such that the diameter of the hemisphere is equal to edge of the cube. Determine the volume of the remaining block.
- 70. A juice seller was serving his customers using glasses as shown in the figure. The inner diameter of the [5] cylindrical glass was 5.6 cm, but the bottom of the glass had a hemispherical raised portion which reduced the capacity of the glass. If the height of the glass was 10 cm, find the apparent capacity and the actual capacity of the glass.



- 71. The volume of a right circular cone is  $9856 \text{ cm}^3$ . If the diameter of the base is 28 cm, find
  - i. height of the cone,
  - ii. slant height of the cone,
  - iii. curved surface area of the cone.
- 72. A bus stop is barricaded from the remaining part of the road, by using 50 hollow cones made of recycled [5] cardboard. Each cone has a base diameter of 40 cm and height 1 m. If the outer side of each of the cones is to be painted and the cost of painting is ₹ 12 per m<sup>2</sup>, what will be the cost of painting all these cones? (Use  $\pi$  = 3.14 and take  $\sqrt{1.04}$  = 1.02)
- 73. How many meters of cloth, 5 m wide, will be required to make a conical tent, the radius of whose base is 7 m [5] and height is 24 m?
- 74. What length of tarpaulin 3 m wide will be required to make conical tent of height 8 m and base radius 6 m? [5] Assume that the extra length of material that will be required for stitching margins and wastage in cutting is approximately 20 cm. (Use  $\pi$  = 3.14)
- 75. A right angled triangle with sides 3 cm and 4 cm is revolved around its hypotenuse. Find the volume of the [5] double cone thus generated.

[5]